

IN THE CLAIMS:

Kindly change claims 9, 10, 31 and 35, to read as follows.

1 1. (previously presented) Apparatus for printing a
2 desired image on a printing medium, based upon input
3 image data, by construction from individual marks of at
4 least one colorant, formed in a pixel grid; said apparatus comprising:
5
6 for each colorant, at least one respective multielement printing array that is subject to colorant-deposition error;
7
8 means for measuring such colorant-deposition error
9 of the at least one array;
10
11 means for modifying a multicolumn, multirow numerical tabulation that forms a mapping between such input
12 image data and such marks, to compensate for the measured
13 colorant-deposition error; and
14
15 means for printing using the modified mapping.

1 2. (original) The apparatus of claim 1, wherein the
2 mapping is selected from the group consisting of:
3 an optical-density transformation of the image data
4 to such construction from individual marks; and
5 a spatial-resolution relationship between the image
6 data and such pixel grid.

1 3. (original) The apparatus of claim 2, wherein:
2 the optical-density transformation comprises a half-
3 toning matrix; and
4 the spatial-resolution relationship comprises a
5 scaling of the image data to such pixel grid.

1 4. (previously presented) The apparatus of claim 1,
2 wherein:
3 said at least one multielement printing array com-
4 prises a plurality of multielement printing arrays that
5 print in a corresponding plurality of different colors or
6 color dilutions, respectively, each multielement printing
7 array being subject to a respective colorant-deposition
8 error; and
9 the measuring means and the mapping-modifying means
10 each operate with respect to each one of the plurality of
11 multielement printing arrays respectively.

1 5. (original) The apparatus of claim 4, wherein:
2 for at least one of the plurality of multielement
3 printing arrays, the colorant-deposition error comprises
4 a respective pattern of printing-density defects; and
5 wherein:
6 the measuring means comprise means for measuring the
7 pattern of printing-density defects for each multielement
8 printing array respectively; and
9 the modifying means comprising means for applying
10 the respective pattern of defects, for at least one of
11 the multielement printing arrays, to modify a respective
12 said mapping.

1 6. (original) The apparatus of claim 4, wherein:
2 for at least one of the plurality of multielement
3 printing arrays, the colorant-deposition error comprises
4 a swath-height error;
5 the measuring means comprise means for measuring the
6 swath-height error for each multielement printing array
7 respectively; and
8 the modifying means comprise means for applying the
9 respective swath-height error, for at least one of the
10 multielement printing arrays, to modify a respective said
11 mapping.

1 7. (previously presented) The apparatus of claim 1,
2 wherein:
3 the colorant-deposition error comprises a pattern of
4 printing-density defects;
5 the measuring means comprise means for measuring the
6 pattern of printing-density defects;
7 the modifying means comprise:
8
9 means for deriving a correction pattern from
10 the measured pattern of printing-density
11 defects, and
12
13 means for applying the correction pattern to
14 modify a halftone thresholding process;
15 and
16
17 for each colorant, the printing means comprise means
18 for printing such image incrementally, using the modified
19 halftone thresholding process.

1 8. (previously presented) The apparatus of claim 1,
2 wherein:
3 the colorant-deposition error comprises a swath-
4 height error or otherwise corresponds to an optimum dis-
5 tance of printing-medium advance;
6 the measuring means comprise means for measuring the
7 swath-height error or determining the optimum distance;
8 the modifying means comprise:
9
10 means for deriving a correction pattern from
11 the measured swath-height error or deter-
12 mined optimum distance, and
13
14 means for applying the correction pattern to
15 modify a halftone thresholding process;
16 and
17
18 for each colorant, the printing means comprise means
19 for printing such image incrementally, using the modified
20 halftone thresholding process.

1 9. (currently amended) A method of printing a desired
2 image, by construction from individual marks of at least
3 one colorant, formed in a pixel grid by at least one mul-
4 tielement printing array that is subject to a pattern of
5 printing-density defects; said method comprising the
6 steps of:
7 measuring such pattern of printing-density defects;
8 deriving a correction pattern from the measured pat-
9 tern of printing-density defects;
10 applying the correction pattern to modify a halftone
11 thresholding process that uses a halftoning matrix which
12 is a predefined numerical array;
13 wherein the applying step comprises preparing a
14 modified form of the predefined numerical array, and then
15 using that modified form of the array; and
16 for each said colorant, printing such image by said
17 at least one multielement array respectively, using the
18 modified halftone thresholding process.

1 10. (currently amended) The method of claim 9, for use
2 with a printmask in plural-pass printing, said printmask
3 being a defined system of numerical values, distinct from
4 the measured pattern of defects and distinct from the de-
5 derived correction pattern, that establishes the printing
6 pass in which each ink mark is to be made; and further
7 comprising the steps of, before or as a part of the ap-
8 plying step:

9 using such printmask to determine a relationship be-
10 tween the halftone matrix and the multielement array; and
11 employing the relationship in the applying step to
12 control application of the correction pattern to the
13 halftone matrix.

1 11. (original) The method of claim 9, wherein:
2 the printing step comprises single-pass printing.

1 12. (original) The method of claim 9, for use with said
2 at least one multielement incremental-printing array that
3 comprises a plurality of scanning multielement printing
4 arrays that print in a corresponding plurality of differ-
5 ent colors or color dilutions, each multielement printing
6 array being subject to a respective swath-height error;
7 and wherein:

8 the measuring, deriving, applying and printing steps
9 are employed to modify swath height of at least one of
10 the scanning multielement printing arrays, for accommo-
11 dating any swath-height error present in each multiele-
12 ment printing array respectively.

1 13. (original) The method of claim 9, for use with said
2 at least one multielement incremental-printing array that
3 comprises a plurality of multielement printing arrays
4 that print in a corresponding plurality of different
5 colors or color dilutions, each multielement printing ar-
6 ray being subject to a respective pattern of printing-
7 density defects; and wherein:

8 the measuring, deriving, applying and printing steps
9 are each performed with respect to each multielement
10 printing array respectively.

1 14. (original) The method of claim 13, for use with
2 such plurality of multielement incremental-printing ar-
3 rays that are also each subject to a respective swath-
4 height error; and wherein:
5 the measuring, deriving, applying and printing steps
6 are also employed to modify swath height of at least one
7 of the multielement printing arrays, for accommodating
8 any swath-height error present in each multielement
9 printing array respectively.

1 15. (original) The method of claim 9, wherein:
2 the halftone thresholding process comprises defini-
3 tion of a halftone matrix.

1 16. (original) The method of claim 9, wherein:
2 the halftone thresholding process comprises an
3 error-diffusion protocol.

1 17. (original) The method of claim 16, wherein the
2 error-diffusion protocol comprises at least one of:
3 a progressive error-distribution allocation protocol
4 of such error-diffusion halftoning; and
5 a decisional protocol for determining whether to
6 mark a particular pixel.

- 1 18. (original) The method of claim 9, wherein:
2 the applying step comprises replacing values above
3 or below a threshold value.
- 1 19. (original) The method of claim 9, wherein:
2 the applying step comprises multiplying values by a
3 linear factor.
- 1 20. (original) The method of claim 9, wherein:
2 the applying step comprises applying a gamma correc-
3 tion function to values.
- 1 21. (original) The method of claim 9, wherein the
2 modifying step comprises a combination of at least two
3 of:
4 replacing values above or below a threshold value;
5 multiplying each values by a linear factor; and
6 applying a gamma correction function to values.
- 1 22. (original) The method of claim 9, wherein:
2 for each of the plurality of multielement arrays,
3 the measuring, deriving and applying steps are each per-
4 formed at most only one time for a full image.

1 23. (original) The method of claim 9, wherein:
2 the applying step comprises modifying the darkness
3 of substantially each mark printed by an individual
4 printing element whose density is defective.

1 24. (original) The method of claim 9, wherein:
2 the applying step comprises modifying the average
3 number of dots printed by an individual printing element
4 whose density is defective.

1 25. (previously presented) A method of printing a
2 desired image, based on input image data, by construction
3 from individual marks of at least one colorant, formed in
4 a pixel grid by at least one scanning multielement print-
5 ing array; said printing being subject to print-quality
6 defects due to departure of printing-medium advance from
7 an optimum value; said method comprising the steps of:
8 measuring a parameter related to such print-quality
9 defects;
10 based on the measured parameter, scaling such input
11 image data to compensate for said departure; and
12 for each said colorant, printing such marks with
13 said at least one scanning multielement array using the
14 scaled input image data.

1 26. (original) The method of claim 25, wherein:
2 the parameter comprises such print-quality defects;
3 and
4 the measuring step comprises measuring such print-
5 quality defects.

1 27. (original) The method of claim 26, wherein:
2 the defects comprise swath-height error; and
3 the measuring step comprises measuring swath-height
4 error.

1 28. (original) The method of claim 26, wherein:
2 the defects comprise area-fill nonuniformity; and
3 the measuring step comprises:
4
5 using a sensing system to measure area-fill
6 nonuniformity for plural printing-medium
7 advance values, and
8
9 selecting a printing-medium advance value that
10 corresponds to minimum area-fill non-
11 uniformity.

1 29. (original) The method of claim 25, wherein:
2 the parameter comprises such optimum value; and
3 the measuring step comprises determining such opti-
4 mum value.

1 30. (original) The method of claim 25, for use with
2 said at least one scanning multielement printing array
3 that comprises a plurality of multielement printing ar-
4 rays that print in a corresponding plurality of different
5 colors or color dilutions, each multielement printing ar-
6 ray being subject to a respective swath-height error;
7 wherein:
8 the measuring, scaling and printing steps are each
9 performed with respect to each multielement printing
10 array respectively.

1 31. (currently amended) The method of claim 30, where-
2 in:
3 at least some of the different printing arrays have
4 optimum advance values or swath-height values that are,
5 respectively, different from one another; and
6 the printing step comprises:
7
8 comparing optimum advance values or swath-
9 height values measured for the plurality
10 of multielement printing arrays respec-
11 tively, to find the smallest of said
12 values;
13
14 selecting a particular multielement printing
15 array whose said value is substantially
16 the smallest;
17
18 using, in common for the plurality of printing
19 arrays, substantially said selected small-
20 est value; and
21
22 for substantially each array other than the
23 particular array, operating with a respec-
24 tive reduced number of printing elements
25 and with rescaled data, to match an actual
26 effective swath height of the particular
27 array.

1 32. (original) The method of claim 31, wherein:
2 said smallest of said values is determined taking
3 into account the maximum available number of printing
4 elements in the corresponding array.

1 33. (original) The method of claim 25, further compris-
2 ing the step of:
3 after the scaling step, iterating the measuring and
4 scaling steps to allow for nonlinearity in such print-
5 quality defects.

1 34. (previously presented) Apparatus for printing a
2 desired image on a printing medium, based upon input
3 image data, by construction from individual marks formed
4 in a pixel grid; said apparatus comprising:
5 at least one multielement incremental-printing array
6 that is subject to colorant-deposition error;
7 means for measuring such colorant-deposition error
8 of the at least one array;
9 means for modifying a multicolumn, multirow numeri-
10 cal tabulation that forms a mapping between such input
11 image data and such marks, to compensate for the measured
12 colorant-deposition error; and
13 means for printing using the modified mapping;
14 wherein the multielement printing array is an inkjet
15 printhead.

1 35. (currently amended) A method of printing a desired
2 image, by construction from individual marks formed in a
3 pixel grid by at least one multielement printing array
4 that is subject to a pattern of printing-density defects;
5 said method comprising the steps of:
6 measuring such pattern of printing-density defects;
7 deriving a correction pattern from the measured pat-
8 tern of printing-density defects;
9 applying the correction pattern to modify a halftone
10 thresholding process that uses a halftoning matrix which
11 is a predefined numerical array;
12 wherein the applying step comprises preparing a
13 modified form of the predefined numerical array, and then
14 using that modified form of the array; and
15 printing such image using the modified halftone
16 thresholding process;
17 wherein the multielement printing array is an inkjet
18 printhead.

1 36. (previously presented) A method of printing a
2 desired image, based on input image data, by construction
3 from individual marks formed in a pixel grid by at least
4 one scanning multielement printing array; said printing
5 being subject to print-quality defects due to departure
6 of printing-medium advance from an optimum value; said
7 method comprising the steps of:
8 measuring a parameter related to such print-quality
9 defects;
10 based on the measured parameter, scaling such input
11 image data to compensate for said departure; and
12 printing such image using the scaled input image
13 data;
14 wherein the multielement printing array is an inkjet
15 printhead.

1 37. (previously presented) Apparatus for printing a
2 desired image on a printing medium, based upon input
3 image data, by construction from individual marks of at
4 least one colorant, formed in a pixel grid; said appara-
5 tus comprising:
6 for each colorant, respective means for printing
7 incrementally in that colorant;
8 each said printing means, for a particular one col-
9 orant, comprising at least one respective incremental-
10 printing array that is subject to colorant-deposition
11 error;
12 means for measuring such colorant-deposition error
13 of the at least one array;
14 means for modifying a multicolumn, multirow numeri-
15 cal tabulation that forms a mapping between such input
16 image data and such marks, to compensate for the measured
17 colorant-deposition error; and
18 means for printing using the modified mapping.

1 38. (previously presented) Apparatus for printing a
2 desired image on a printing medium, based upon input
3 image data, by construction from individual marks formed
4 in a pixel grid; said apparatus comprising:
5 at least one multihundred-element printing array
6 that is subject to colorant-deposition error;
7 means for measuring such colorant-deposition error
8 of the at least one array;
9 means for modifying a multicolumn, multirow numeri-
10 cal tabulation that forms a mapping between such input
11 image data and such marks, to compensate for the measured
12 colorant-deposition error; and
13 means for printing using the modified mapping.

1 39. (previously presented) The apparatus of claim 38,
2 wherein:
3 the multihundred-element array has at least three
4 hundred printing elements.

1 40. (previously presented) Apparatus for printing a
2 desired image on a printing medium, based upon input
3 image data, by construction from individual marks formed
4 in a pixel grid; said apparatus comprising:
5 at least one multielement incremental printing
6 array, having at least thirty printing elements, that is
7 subject to colorant-deposition error;
8 means for measuring such colorant-deposition error
9 of the at least one array;
10 means for modifying a multicolumn, multirow numeri-
11 cal tabulation that forms a mapping between such input
12 image data and such marks, to compensate for the measured
13 colorant-deposition error; and
14 means for printing using the modified mapping.

1 41. (previously presented) The apparatus of claim 40,
2 wherein:
3 the at least one multielement incremental printing
4 array comprises a scanning printhead or a full-page-width
5 printhead.

1 42. (previously presented) The apparatus of claim 40,
2 wherein:
3 the printing means comprise at least one micropro-
4 cessor controlling all of the at least thirty elements
5 simultaneously during printing to select, and selectively
6 actuate, particular elements for printing of particular
7 pixels respectively.